Pre-AP Geometry 13-5 Study Guide: Compound Events (pp 907-913)

Attendance Problems.

One card is drawn from the deck. Find each probability.

1. Selecting a two.

2. Selecting a face card.

Two cards are drawn from the deck. Find each probability.

3. Selecting two kings when the first card is replaced.

4. selecting two hearts the first card is not replaced.

- I can find the probability of mutually exclusive events.
- I can find the probability of inclusive events.

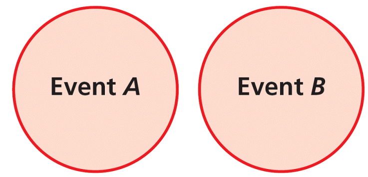
Vocabulary	
simple event	compound event
mutually exclusive events	inclusive events

Common Core

- **CC.9-12.S.CP.7** Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$, and interpret the answer in terms of the model.
- **CC.9-12.S.CP.9 (+)** Use permutations and combinations to compute probabilities of compound events and solve problems.

A **simple event** is an event that describes a single outcome. A **compound event** is an event made up of two or more simple events. **Mutually exclusive events** are events that cannot both occur in the same trial of an experiment. Rolling a 1 and rolling a 2 on the same roll of a number cube are mutually exclusive events.

Mutually Exclusive Events



Mutually Exclusive Events

WORDS	ALGEBRA	EXAMPLE
The probability of two mutually exclusive events *A or B* occurring is the sum of their individual probabilities.	For two mutually exclusive events *A* and *B*, $P(A \cup B) = P(A) + P(B)$.	When a number cube is rolled, $P(\text{less than } 3) =$ $P(1 \text{ or } 2) =$ $P(1) + P(2) = \frac{1}{6} + \frac{1}{6} = \frac{1}{3}$.

Remember!

Recall that the union symbol U means “or.”

1 Finding Probabilities of Mutually Exclusive Events

A drink company applies one label to each bottle cap: “free drink,” “free meal,” or “try again.” A bottle cap has a $\frac{1}{10}$ probability of being labeled “free drink” and a $\frac{1}{25}$ probability of being labeled “free meal.”

a. Explain why the events “free drink” and “free meal” are mutually exclusive.

Each bottle cap has only one label applied to it.

b. What is the probability that a bottle cap is labeled “free drink” or “free meal”?

$$P(\text{free drink} \cup \text{free meal}) = P(\text{free drink}) + P(\text{free meal})$$
$$= \frac{1}{10} + \frac{1}{25} = \frac{5}{50} + \frac{2}{50} = \frac{7}{50}$$

Example 1. A group of students is donating blood during a blood drive. A student has a $\frac{9}{20}$ probability of having type O blood and a $\frac{2}{5}$ probability of having type A blood.

A. Explain why the events "type O" and "type A" blood are mutually exclusive.

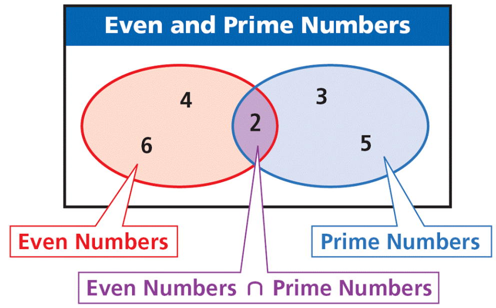
B. What is the probability that a student has type O or type A blood?

5. Guided Practice. Each student cast one vote for senior class president. Of the students, 25% voted for Hunt, 20% for Kline, and 55% for Vila. A student from the senior class is selected at random.

A. Explain why the events "voted for Hunt," "voted for Kline," and "voted for Vila" are mutually exclusive.

B. What is the probability that a student voted for Kline or Vila?

13-5 Assignment (pp 911) 12-13.



Inclusive events are events that have one or more outcomes in common. When you roll a number cube, the outcomes "rolling an even number" and "rolling a prime number" are not mutually exclusive. The number 2 is both prime and even, so the events are inclusive.

There are 3 ways to roll an even number, {2, 4, 6}.
There are 3 ways to roll a prime number, {2, 3, 5}.

The outcome "2" is counted twice when outcomes are added (3 + 3) . The actual number of ways to roll an even number or a prime is 3 + 3 – 1 = 5. The concept of subtracting the outcomes that are counted twice leads to the following probability formula.

Inclusive Events

WORDS	The probability of two inclusive events *A* or *B* occurring is the sum of their individual probabilities minus the probability of *both* occurring.
ALGEBRA	For two inclusive events *A* and *B*, $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.
EXAMPLE	When you roll a number cube, $P(\text{even number or prime}) =$ $P(\text{even or prime}) = P(\text{even}) + P(\text{prime}) - P(\text{even and prime})$ $= \frac{3}{6} + \frac{3}{6} - \frac{1}{6} = \frac{5}{6}$.

2 Finding Probabilities of Inclusive Events

Find each probability on a die.

A rolling a 5 or an odd number

$$P(5 \text{ or odd}) = P(5) + P(\text{odd}) - P(5 \text{ and odd})$$

$$= \frac{1}{6} + \frac{3}{6} - \frac{1}{6}$$

5 is also an odd number.

$$= \frac{1}{2}$$

B rolling at least one 4 when rolling 2 dice

$$P(4 \text{ or } 4) = P(4) + P(4) - P(4 \text{ and } 4)$$

$$= \frac{1}{6} + \frac{1}{6} - \frac{1}{36}$$

There is 1 outcome in 36 where both dice show 4.

$$= \frac{11}{36}$$

<u>Example 2</u>. Find the probability on a number cube.

A. Rolling an odd number or a number greater than 2.

B. Rolling a 4 or an even number

6. <u>Guided Practice.</u> A card is drawn from a deck of 52. Find the probability of each.

A. Drawing a king or a heart.

B. Drawing a red card (hearts or diamonds) or a face card (jack, queen, or king).

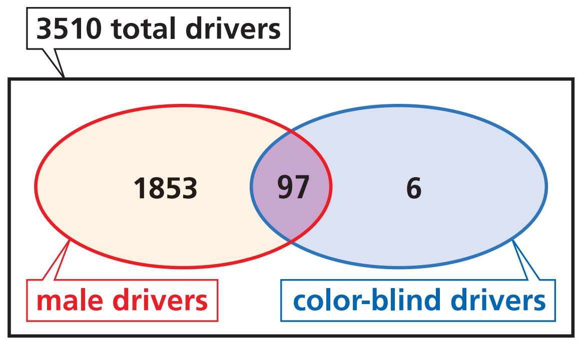
13-5 Assignment (pp 911) 12-15.

3 Health Application

Of 3510 drivers surveyed, 1950 were male and 103 were color-blind. Only 6 of the color-blind drivers were female. What is the probability that a driver was male or was color-blind?

Step 1 Use a Venn diagram.

Label as much information as you know. Being male and being color-blind are inclusive events.



Step 2 Find the number in the overlapping region.

Subtract 6 from 103. This is the number of color-blind males, 97.

Step 3 Find the probability.

$$= P(\text{male} \cup \text{color-blind}) =$$
$$= P(\text{male}) + P(\text{color-blind}) - P(\text{male} \cap \text{color-blind})$$
$$= \frac{1950}{3510} + \frac{103}{3510} - \frac{97}{3510} = \frac{1956}{3510} \approx 0.557$$

The probability that a driver was male or was color-blind is about 55.7%.

<u>Example 3</u>. Of 1560 students surveyed, 840 were seniors and 630 read a daily paper. The rest of the students were juniors. Only 215 of the paper readers were juniors. What is the probability that a student was a senior or read a daily paper?

7. <u>Guided Practice</u>. Of 160 beauty spa customers, 96 had a hair styling and 61 had a manicure. There were 28 customers who had only a manicure. What is the probability that a customer had a hair styling or a manicure?

13-5 Assignment (pp 911-913) 12-15, 17.

4 *Book Club Application*

There are 5 students in a book club. Each student randomly chooses a book from a list of 10 titles. What is the probability that at least 2 students in the group choose the same book?

$P(\text{at least 2 students choose same}) = 1 - P(\text{all choose different})$ *Use the complement.*

$$P(\text{all choose different}) = \frac{\text{number of ways 5 students can choose different books}}{\text{total number of ways 5 students can choose books}}$$

$$= \frac{{}_{10}P_5}{10^5}$$

$$= \frac{10 \cdot 9 \cdot 8 \cdot 7 \cdot 6}{10 \cdot 10 \cdot 10 \cdot 10 \cdot 10} = \frac{30{,}240}{100{,}000} = 0.3024$$

$P(\text{at least 2 students choose same}) = 1 - 0.3024 = 0.6976$

The probability that at least 2 students choose the same book is 0.6976, or 69.76%.

Example 4. Each of 6 students randomly chooses a butterfly from a list of 8 types. What is the probability that at least 2 students choose the same butterfly?

8. Guided Practice. In one day, 5 different customers bought earrings from the same jewelry store. The store offers 62 different styles. Find the probability that at least 2 customers bought the same style.

13-5 Assignment

- (pp 911-913) 12-15, 17, 19, 20, 22-24, 26, 30, 34, 35, 38
- Ready to Go On Lesson 13B